

Duration: 3 hours

Max Marks: 80

Note: Attempt any 4 questions  
 Figures to the right indicate full marks  
 Assume data wherever required and mention it clearly

Q1 (i)

15

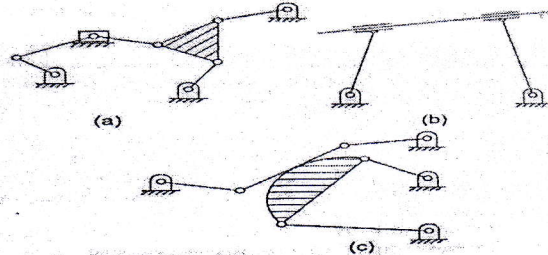


Figure 1

For the kinematic linkages shown in figure. 1a, 1b and 1c Calculate the following

1. The number of ternary links
2. The no. of joints or pairs
3. The no. of binary links
4. The number of total links
5. The No. of Degree of freedom

(ii) Short note on the following

- (i) Link (ii) Kinematic pair lower pair and higher pair (iii) Degrees of freedom (iv) Kinematic chain

5

Q2

Design Linkage mechanism is to generate the functional relationship  $y = x^{0.33}$  for the range of  $x = 1.25$  to  $4$  & the input and output angles are  $90^\circ$  and  $60^\circ$  respectively Determine angular acceleration assume three point accuracy method

20

Q3

A. Synthesize an offset slider crank mechanism to meet the following requirement.  $\theta_{12} = 30^\circ$ ,  $\theta_{13} = 55^\circ$ ,  $S_{12} = 30 \text{ mm}$ ,  $S_{13} = 65 \text{ mm}$  Offset = 15mm The input crank rotates through  $\theta$  in clockwise direction and the slider moves from left to right. Use relative pole technique.

10

- B. Write short note on  
 a) Synthesis of a mechanism  
 b) Properties of a pole triangle

5+5



12

Paper / Subject Code: 60702 / Analysis and Synthesis of Mechanisms.

- Q4 (i) Design a four bar linkage to meet the following specifications:-
- |              |                 |                                |                                 |           |
|--------------|-----------------|--------------------------------|---------------------------------|-----------|
| <b>Crank</b> | <b>Position</b> | <b>Angular velocity</b>        | <b>Angular acceleration</b>     | <b>10</b> |
| Input        | $\theta = 90^0$ | $\omega_2 = 3\text{rad/sec}$   | $\alpha_2 = 0\text{ rad/sec}^2$ |           |
| Output       | $\phi = 90^0$   | $\omega_4 = 1.5\text{rad/sec}$ | $\alpha_4 = 0\text{rad/sec}^2$  |           |
- (ii) Explain the procedure to get approximate dwell linkages using four accuracy points with suitable sketches **10**
- Q5 Synthesize the aligned slider crank mechanism satisfying the following conditions:-
- |                             |                          |           |
|-----------------------------|--------------------------|-----------|
| <b>Input crank rotation</b> | <b>Slider motion</b>     | <b>20</b> |
| $\phi_{12} = 25^0$          | $S_{12} = 75\text{ mm}$  |           |
| $\phi_{13} = 70^0$          | $S_{13} = 108\text{ mm}$ |           |
| $\phi_{14} = 85^0$          | $S_{14} = 164\text{ mm}$ |           |
- Q6 Using overlay techniques Write short notes on (Any Two)
- (i) Explain the following
- (i). Classification of Mechanisms **10**
  - (ii). Equivalent mechanisms **10**
- (ii) Explain double points in coupler curves **10**
- (iii) Assuming suitable link proportions show and explain the cognate linkages of a four bar linkages. Also state the velocity relations of various links **10**

-X-X-X-X-X-X-